

Applicant respectfully requests entry of this proposed drawing amendment. In regard to the Examiner's objections under 37 CFR §1.83 (a), Applicant submits that the drawings indeed show each every feature of the invention as now claimed other than those limitations which need not be illustrated. For example, Applicant notes that a drive substrate having active devices and opposite electrodes formed on an opposite substrate or the formation of a planarization film which covers active devices or the formation of transparent electrode films are well-known in the art. The prior are cited by the Examiner, such as, United States patent No. 6, 144,435 confirms this fact. Each of these elements or structures are found in this reference and our conventional structures that are found typically in liquid crystal displays. Applicant further submits that the detailed analysis set forth below confirms that the drawings actually show all the claim limitations as required.

In regard to the Examiner's requirement for a new title of the invention, Applicant has amended the title of the invention. Applicant submits that this new title clearly indicates the general subject matter of the present invention to which the claims are directed. As noted above, in regard to the objection to the specification, Applicant submits that the appropriate antecedent basis for all the claim limitations is set forth in the specification. A more detailed response to this issue raised by the Examiner is set forth below. Furthermore, in regard to the claim objections, Applicant submits that the modifications to the claims detailed above and additional clarification set forth below more than adequately address these issues raised by the Examiner.

Applicant respectfully requests reconsideration of the prior art rejections set forth by the Examiner under 35 USC §§102 and 103. Applicant respectfully submits that the references of record, whether considered alone, or in combination, fail to either teach or suggest Applicants presently claimed invention.

Applicant's presently claimed invention is directed to new and improved techniques for sealing a liquid crystal display device. More specifically, Applicant's new and improved techniques for sealing a liquid crystal display device have overcome some of the deficiencies of the prior art sealing techniques. These prior art techniques are described in Applicant's specification beginning on page 2. The two alternate types are referred to as the screen printing method and the dispensing method.

In the screen printing method, woven thin wires of silk are utilized to form a screen and a resin material is selectively provided in order to allow the formation of a pattern of the seal material. A squeegee device is pressed into the screen plate in order to dispense the seal material.

In the alternate dispensing method, the seal material is placed into a cylinder 30 and the material is discharged from a needle via compressed air to draw a seal pattern on the substrate 36. Regardless of the application technique in the prior art, the seal material is applied on the periphery along the edge of the opposite substrates and the seal material seals the gap between the opposed substrates 42. These conventional techniques have several very serious shortcomings which are detailed in the specification on page 4. First, in the screen printing technique, the orientation film that is applied on the substrate readily comes into contact with the screen material and is contaminated by substances that are adhered to the screen plate 10. Alternatively the orientation film may be physically damaged by the screen plate. This may result in orientation failure, image failure and the like.

In the alternate dispensing method, it is necessary to move either a stage on which the substrate 36 is placed or the needle 32 in order to trace the shape of the seal pattern which is a time-consuming process. Another problem is that the gap between the tip of the needle 32 in the substrate must be kept constant so that a high precision control may be achieved. See, for

example, Applicant's specification at page 4. Applicant's invention has overcome the shortcomings and deficiencies of these prior art techniques.

In accordance with Applicants claimed invention, and a preferred exemplary embodiment thereof, the seal between substrates on a liquid crystal display is formed using patterning techniques which are well-known in the field of semiconductor processing. In a preferred exemplary embodiment, the seal structures formed on the periphery of the display substrate members are formed via photo-lithography techniques which employ the use of photosensitive resins and the like. Advantageously, the steps associated with the formation of the seal member are performed simultaneously during other semiconductor processing of the display in order to achieve greater efficiencies in the manufacturing process. More specifically, in the preferred exemplary embodiment, the processing for the formation of the seal structure is also used in the formation of at least one other structure of the display. For example, a film that is used to form the seal structure also be used to form another structure of the pixel elements or the film may also be utilized as a portion of another structure as well. The prior art of record provides no teaching or suggestion regarding this advance in the art.

In one example, the seal may be formed in a film forming step at the same time with the formation of pixel pattern on the drive substrate and the opposed substrates. The steps for forming these other elements of the display are themselves well-known in the art and need no further elaboration. One difference from the prior art is that the prior art provides no teaching or suggestion regarding the formation of the seal structure in the same manner as the formation of these other structures.

The individual seal patterns may also be corrugated on the surface in order to provide improved mutual engagement of the seal portions. As noted in the specification at page 10, the seal structure forming steps may be performed simultaneously or during similar steps in


the formation of the wiring structures that are typically performed in the manufacture of a liquid crystal display.

A seal pattern may be formed using a synthetic resin such as a photo-reactive acrylic resin. See page 11, in the first-line. The seal may be formed by spin coating liquid material for forming the seal film onto the substrate which is rotating at high-speed. The thickness of the seal pattern can be controlled depending upon the application of material and rotation of the wafer. After the seal film has dried, a mask having a pattern corresponding to the desired seal pattern is provided on top of the seal film and the seal film is submitted to light exposure through this mask. The seal film is thus selectively hardened. The mask is then removed to leave only the seal pattern. The seal pattern may be further processed by known lithography techniques and etching to form the described corrugations pattern. See, for example, Applicant's specification at page 11 lines 7-20. Applicant submits that the references of record, provide no teaching or suggestion whatsoever regarding the claimed processing techniques. The prior merely describes techniques which have the same deficiencies and shortcomings described in the specification.

More specifically, the primary reference upon which the Examiner relies in rejecting the claims, United States patent No. 6,144,435 is merely directed to a liquid crystal device with spacer beads between a pair of substrates wherein the liquid crystal layer has a thickness that is smaller than a diameter of the spacer beads and a maximum thickness of a coating layer. There is simply no teaching or suggestion whatsoever regarding the formation of the seal member in the manner described by Applicant in the instant application and as also set forth in the claims. The remaining references of record, similarly fail to provide any teaching or suggestion whatsoever regarding the seal member described and claimed in the present application. Accordingly, Applicant respectfully requests that the Examiner now allow all claims in the application.

Respectfully submitted

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